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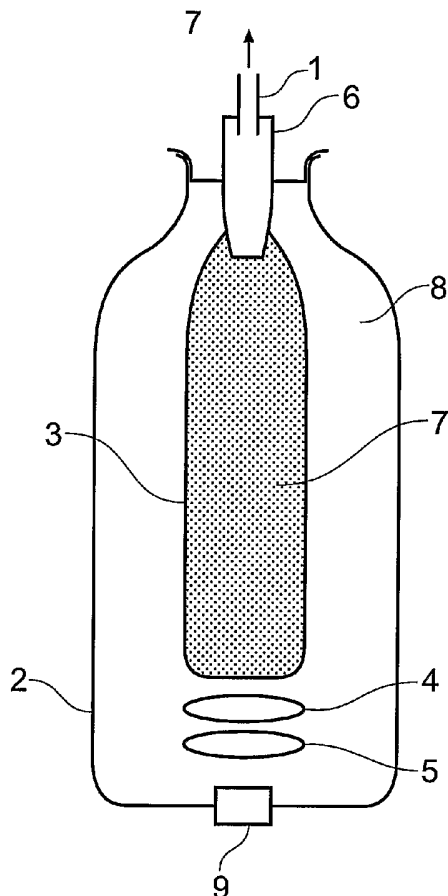
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[Continued on next page]

(54) Title: PRESSURISED DISPENSING OF FLUID



(57) Abstract: This invention relates to devices and systems for the pressurised dispensing of fluid, in particular from a container provided with a valve or tap (6). The propellant is generated by a chemical reaction.

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SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

PRESSURISED DISPENSING OF FLUID

Field of the invention

- 5 This invention relates to devices and systems for the pressurised dispensing of fluid, in particular from a container provided with a valve or tap.

Background to the invention

10 Containers for dispensing fluids under pressure are known which use compressed gases or hydrocarbons to put pressure on a secondary container which is housed in a primary container. The space between the primary and secondary containers normally contains the compressed gas or the hydrocarbons which have been introduced under pressure by means of an appropriate gassing system.

15 The use of propellants, especially hydrocarbons, requires special on-site handling and safety requirements. In conventional systems, gases are pressure fed into the primary container. Such operations have to be located in areas where an explosion, if it occurs, will not have too serious an effect on the environment and the risk to life and property is minimised.

20

Statements of the invention

According to the present invention there is provided a pressurised discharge device comprising an outer container housing an inner container within which is located a product to be dispensed from the container through release means, such as a valve or
25 a tap, the inner container being responsive to pressure generated between the inner and outer containers so as to force fluid contained within the inner container through the release means to the exterior of the container, there being located between the outer and inner containers a pressure generating gas formed by interaction between at least one reactant and a liquid, both of which are loaded into the device between the
30 inner and outer containers.

In a preferred embodiment of the invention the inner container is formed of a flexible material. For example the inner container is a flexible bag, such as a plastics bag or an aluminium bag.

- 5 In an alternative embodiment of the invention the inner container is a solid walled container with an open end sealed by a movable piston, the piston being able to move as a result of pressure generated within the outer container.

10 In a further alternative embodiment of the invention the inner container may be, for instance, a secondary bladder

The inner container should have the ability to hold and dispense a solution or other fluid with varying viscosity once the reactant and the liquid have interacted to create the pressure.

15

The outer container may be made of any suitable material, for instance, tinplate, aluminium, plastics or glass.

20 The inner container and the outer container may be fitted with a snap-fit closure, a threaded closure, a crimped-on closure, a glued-on closure, a heat-seal closure or they may be sonically sealed together.

The reactant may be in the form of a gas, a solid or a liquid.

25 Preferably the reactant is a solid.

The solid reactant may be, for instance, a pellet of any suitable size or form, for instance, in the form of a tablet, a capsule, a gel, a powder.

30 The powder is preferably retained within a sachet.

Preferably the tablet comprises sodium bicarbonate (sodium hydrogen carbonate) and citric acid.

Alternatively, two (or more) pellets or tablets may be provided each containing a reactant. For instance, one tablet may contain sodium bicarbonate and another citric acid.

The activating substance is any fluid or fluid composition suitable for interacting with the reactant to cause a gas generating reaction. Preferably the activating substance is a liquid, for example water or an alternative aqueous solution. Alternatively the fluid is a gas.

In a further alternative, carbon dioxide pellets are used to produce the pressure generating gas.

Immediately following the placing of the tablet (or tablets) within the container, the container is closed and the fluid in the tablet will begin to create the pressure required to dispense a product which is located within the inner bag-like container. Alternatively the product may be injected into the inner container shortly after the closing or sealing of the system.

The purpose of the tablet is to create a pressure immediately upon the tablet and solution coming into contact, the pressure being sufficient to dispense a product from the inner container when the user so wishes.

In an alternative embodiment, the solid reactant or reactants may be located in a sachet which is initially attached to the rolled up inner bag. When the inner bag is filled, it unrolls, rupturing the sachet and releasing its contents into water or other liquid in the outer container. In a further alternative embodiment the outer surface of the inner bag is coated e.g. by spraying with reactant material. Again when the inner bag unrolls within the outer container, the coating makes contact with the liquid in the container and gas generation results.

In a further alternative embodiment, a dry acid is brought into contact with a solution which is located in a pack in the container before a bag on valve is added or is fed, for instance, through a bypass valve or self-sealing valve in the wall of the outer container.

5

Typically, the maximum pressure reached at ambient temperature is 80 psi. The reaction then stops until pressure is released or carbon dioxide is dissolved into the solution.

10 A further alternative embodiment relies on the contents of the inner container generating a sufficient pressure to bring together the solid reactant and fluid activating substance placed separately in the outer container. The device in the outer container may, for instance, comprise a single cell or multiple cells.

15 A single-celled device placed into the outer container may contain the solid reactant whilst the fluid activating substance may be introduced into the outer container via the valve/tap mechanism or valve/self sealing mechanism. Upon filling of the inner container with a substance the consequent pressure increase in the outer container results in the fracture/collapse/disruption of the cell, bringing together the solid
20 reactant and the fluid activating substance and thereby generating an increased pressure in the outer container.

Alternatively a multi-celled device placed in the outer container may contain the individual gas producing ingredients (ie the solid reactants and the fluid activating
25 substance) arranged separately within cells in a manner such that on the filling of the inner container with a substance, the consequent pressure increase in the outer container results in the fracture/collapse/disruption of these cells, bringing together the solid reactants and the fluid activating substance, thereby generating an increased pressure in the outer container. For example, the cells may be bounded by frangible
30 membranes.

In a further alternative embodiment of the invention a solid reactant, in any form, is placed in the outer container. This solid reactant can be activated by introducing fluid by any method previously described above, for example through the valve/tap mechanism or the valve/self sealing mechanism.

5

Detailed description of the invention

The invention will now be further described, by way of examples only, and with reference to the accompanying drawing which is a longitudinal section through a device, in the form of a container, according to the present invention.

Referring to the accompanying drawing, a device in accordance with the present invention includes a primary container 2 and a secondary container 3. Primary container 2 has had added to it gas pressure producing tablets, by example, sodium bicarbonate and citric acid, as well as a quantity of water.

As illustrated the secondary container 3 is fitted inside the primary container 2 and the former has a dispensing valve or tap 6. The two containers are sealed together.

Gas created from the interaction between the tablets 4, 5 and the water acts to pressurise the primary container 2 throughout the void 8. Pressure is thereby exerted on secondary container 3.

The secondary container 3 is filled with a product 7 which is dispensed via the outlet 1. Releasing pressure on the secondary container 3 by the attached valve, or in some other way, allows a product to be dispensed from the secondary container 3.

The gas producing tablets 4,5 can be introduced to the primary container 2 before, during or after filling of the secondary container depending on the process being used.

The speed of gas pressure production may be controlled by the use of surface coatings on the tablets in order to assist in other requirements of the process, for

example, a pressure build-up may be required before filling secondary container 3 to prevent the bursting of secondary container 3 during filling.

5 The gas producing ingredients may be introduced to the primary container 2 directly through the open end of primary container 2 prior to introduction of secondary container 3.

10 The gas producing ingredients: the solid reactant and fluid activating substance as described above may be introduced either as a pre-mixed composition or as separate ingredients to the primary container 2 through a feature in the valve/tap mechanism 6 which bypasses the filling route to secondary container 3.

15 Preferably the fluid activating substance is introduced as a water or another aqueous solution through the valve/tap mechanism 6. This is advantageous over the prior art of this part of the valve enabling pressurising gas to be introduced through the valve/tap mechanism 6.

20 Alternatively the gas producing ingredients: the solid reactant and the fluid activating substance as described above, may be introduced either as a pre-mixed composition or as separate ingredients to the primary container 2 through the valve/self-sealing feature 9. Preferably the activating substance is introduced as a water or another aqueous activating substance through the valve/self-sealing feature 9.

25 In a further embodiment of the invention the solid reactant may be introduced through the valve/self-sealing feature 9 and the fluid activating substance introduced through the valve/tap mechanism 6 or vice versa.

30 A tablet comprising sodium bicarbonate (4.82g) and citric acid (2.86g) has a size 9mm thick by 21mm and 23mm in diameter. It was introduced into a conventional pressurised container having a fitted valve. The container size was 45mm x 29mm and had a brimful capacity of 270ml. 10ml of water was loaded into this container.

The pressure created in the container was 60 psi or 4.15 bar. Further tests using the same tablet size reveal that the smaller the container the greater the pressure, the converse being observed with a larger container.

- 5 The duration of maintenance of pressure within such a container was observed. A standard aerosol container was filled with ingredients such as those described above and an appropriate valve secured to the container. The pressure was checked periodically over a period of several months and was observed to have been maintained.

10

In an alternative embodiment using a tablet containing 3.21g sodium bicarbonate and 1.90g citric acid, the pressure reached in a similar container was 40 psi.

- 15 Using similar components to those described above and with the addition of a bag-on valve which was filled to the appropriate level for the type of container, the pressure increases proportionately to the pressure originally generated and this was observed to be the case over a range of containers in various materials such as tinplate, aluminium, glass or plastics.

- 20 It was observed that the system described above is safe, environmentally friendly, non-flammable and flexible. Excellent pressure levels are maintained and even pressure regeneration experienced throughout the product dispensing life, as compared with current gassing devices which suffer from a sharp drop off in pressure with time.

CLAIMS

1. A pressurised discharge device comprising an outer container housing an inner container within which is located a product to be dispensed from the container
5 through release means, such as a valve or a tap, the inner container being responsive to pressure generated between the inner and outer containers so as to force fluid contained within the inner container through the release means to the exterior of the container, there being located between the outer and inner containers a pressure generating gas formed by interaction between at least one ingredient of a reactant and
10 a fluid activating substance, both of which are loaded into the device between the inner and outer container
2. A device according to Claim 1, wherein the inner container is formed from a flexible material.
15
3. A device according to Claim 1, wherein the inner container is a solid walled container with an open end sealed by a movable piston, and wherein movement of said piston and subsequent dispensing of the product is dependent on the pressure generated.
20
4. A device according to any of the preceding claims, wherein the inner container is a bladder, a plastics bag, an aluminium bag, a flexible bag, a bag on valve or a bag on pump or a solid walled container with an open end sealed by a movable piston.
25
5. A device according to any of the preceding claims, wherein the inner container and the outer container are provided with a snap-fit closure, a threaded closure, a crimped-on closure, a glued-on closure or a heat seal closure, or they may be sonically sealed together.
30
6. A device according to any of the preceding claims, wherein the outer container is made of tinplate, aluminium, plastics or glass.

7. A device according to any of the preceding claims, wherein the reactant is solid.
8. A device according to Claim 7, wherein the solid reactant is in the form of a
5 pellet.
9. A device according to Claim 8, wherein the pellet is a tablet or a capsule.
10. A device according to Claim 6, wherein the solid reactant is in the form of a
10 tablet comprising sodium bicarbonate and citric acid and the liquid is water.
11. A device according to Claim 10, wherein two or more tablets are provided, each containing a reactant.
- 15 12. A device according to Claim 11, wherein one tablet contains sodium bicarbonate and the other citric acid.
13. A device according to any of Claims 7 to 12, wherein the solid reactant is located in a sachet attached to the inner bag which is, initially, in a rolled up
20 condition and which, when unrolled, causes the sachet to be ruptured.
14. A device according to any of the preceding claims, wherein at least one of the solid reactant or the fluid activating substance is introduced to the outer container through a valve/tap mechanism which bypasses the filling route to the inner
25 container.
15. A device according to claim 14, wherein the solid reactant and the fluid activating substance are pre-mixed prior to passing through the valve/tap mechanism.
- 30 16. A device according to claim 14, wherein the solid reactant and the fluid activating substance are fed separately through the valve/tap mechanism.

17. A device according to any of the preceding claims, wherein at least one of the solid reactant or the fluid activating substance is introduced to the outer container through a valve/self-sealing feature in the wall of the outer container.

5 18. A device according to claim 17, wherein the ingredients are pre-mixed prior to passing through the valve/self-sealing feature.

19. A device according to claim 17, wherein the ingredients are fed separately through the valve/self-sealing feature.

10

20. A device according to any of the preceding claims, wherein the fluid is a liquid.

21. A device according to claim 20, wherein the fluid is water or an aqueous solution.

15

22. A device according to any of the preceding claims, wherein water or an aqueous solution is introduced to the outer container through a valve/self-sealing feature in the wall of the outer container.

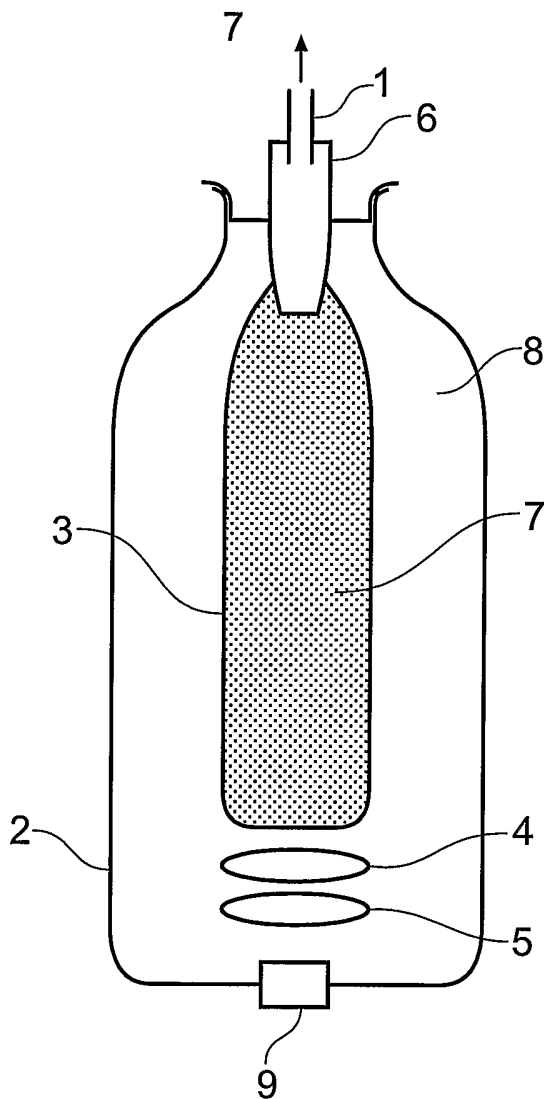
20 23. A device according to claim 22, wherein the water or aqueous solution reacts with the ingredients, the pellets or a rupturing device already in the container.

24. A device according to Claim 1 and substantially as herein described.

25 25. A pressurised discharge device substantially as described herein with reference to the accompanying drawings.

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB2005/001731

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B65D83/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 3 367 545 A (COOK RALPH J) 6 February 1968 (1968-02-06) column 3, line 46 - line 50 column 3, line 70 - column 4, line 2	1-9, 20, 21 10-12 14
X A	EP 0 439 287 A (CCL INDUSTRIES INC) 31 July 1991 (1991-07-31) column 6, lines 4-14; figure 1	1, 2, 4-6 13
Y	BE 870 739 A1 (STAAR DEVELOPMENT CY S.A) 15 January 1979 (1979-01-15) page 2, lines 21-25; figure 1	10-12
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Further documents are listed in the continuation of box C. Patent family members are listed in annex.

Special categories of cited documents:

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>
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Date of the actual completion of the international search 15 August 2005	Date of mailing of the international search report 07/09/2005
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Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Sundell, O
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INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB2005/001731

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 015, no. 374 (M-1160), 20 September 1991 (1991-09-20) -& JP 03 148482 A (YOSHIDA KOGYO KK <YKK>), 25 June 1991 (1991-06-25) abstract -----	10-12
A	US 2 691 548 A (FEUCHT OTTO ET AL) 12 October 1954 (1954-10-12) figure 6 -----	11
A	US 6 244 465 B1 (LANE MICHAEL L ET AL) 12 June 2001 (2001-06-12) figure 10 -----	13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2005/001731

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: 24, 25
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 6.2(a) PCT
2. Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int: al Application No
PCT/GB2005/001731

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